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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

CREPEAU, JONATHAN

ART UNIT

PAPER NUMBER

1795

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/520,519	Applicant(s) SHIMO ET AL.	
	Examiner Jonathan Crepeau	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 March 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-26 and 28-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-26 and 28-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 4, 2009 has been entered.

This Office action addresses claims 21-26, 28-31, and newly added claims 32-41. The claims are newly rejected under 35 USC 103 and 35 USC 112, first paragraph, as necessitated by amendment. This action is non-final.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 21-26 and 28-41 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Independent claims 21, 28, 32, and 38 are each directed to a combination

comprising either a serpentine or interdigitated flow field, and a plurality of projections on a rib or a projection on a rib that continuously changes. It is submitted that the originally-filed application does not support this subject matter in the manner required by 35 USC 112, first paragraph. The instant specification discloses numerous embodiments of the invention. The embodiments of Figs. 7-9 have a serpentine flow channel; the embodiments of Figs. 10 and 11 have interdigitated flow channels; the embodiments of Figs. 13-14 have a plurality of projections differing in height and/or width on a rib; and the embodiments of Figs. 15 and 16 have a continuously changing projection on a rib. There is no disclosure or suggestion in the specification that the different features of the various embodiments are combinable or usable together, as now recited in the present claims. It should be noted that the embodiments disclosing the plurality of projections, or a continuously changing projection, appear to be only directed to flow field plates having straight, parallel flow channels. There is no suggestion or contemplation that the characteristics of these projections are usable in the serpentine and interdigitated embodiments of Figs. 7-11. Likewise, there is no indication in the description of Figs. 7-11 that a continuously changing projection and/or a plurality of projections having different height and/or widths can be used on any portion of a single rib. Accordingly, because the now-claimed subject matter was not envisaged and conveyed in such a way as to make clear that Applicants considered that subject matter to be the invention, it is believed that the originally-filed application as a whole fails to provide adequate written description for the claims.

Claim Rejections - 35 USC § 103

4. Claims 32-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 8-096820 in view of Wilson (U.S. Patent 5,641,586).

JP '820 teaches a fuel cell comprising a membrane electrode assembly and first and second separators having ribs forming gas flow channels. The ribs of both separator plates have one or a plurality of projections (246, 346, 446) on each rib (see Figs. 7, 9, and 11), which function to press the respective electrodes. Regarding claim 36, the projections can be formed along the entire length of the rib and are provided in parallel with each other on the rib in a longitudinal direction (see Fig. 8).

JP '820 does not expressly teach the use of interdigitated flow channels as recited in claims 32 and 38.

Wilson is directed to a fuel cell having an interdigitated flow field.

Therefore, it is submitted that the artisan would be motivated to use the flow field of Wilson in the fuel cell of JP '820. In column 5, line 61, Wilson teaches that "FIG. 5 clearly indicates that the use of interdigitated flow channels reduces pressure drops by at least an order of magnitude." Accordingly, the artisan would be motivated to use the flow field of Wilson in the fuel cell of JP '820. It would further be obvious to locate the projections of JP '820 at any area of the interdigitated flow field to further control reactant pressure at that specific area, thereby rendering obvious the claimed location of a rib positioned at an end of one of the branch flow paths.

JP '820 further does not expressly teach that a plurality of projections that differ in at least one of a height and a width are provided on the rib as recited in claim 32, or that at least one of a height and a width of the projection continuously changes along the direction of the rib as recited in claim 38.

However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because each of these recitations represents a modification that is within the capabilities of a skilled artisan. As disclosed throughout the reference, the purpose of the invention of JP '820 is to enlarge the area of the gas diffusion electrode contributing to the electrochemical reaction by reducing contact pressure with the separator. The skilled artisan would be motivated to further modify the configurations shown in JP '820 as modified by Wilson in an attempt to further the purposes of the invention. For example, the artisan would be motivated to modify the projection(s) in an upstream-downstream direction (longitudinal direction) because it is known that reactant gas pressure is highest at the inlet of the flow field. To account for the flow field pressure drop, it would be obvious to use a graded projection on the rib to vary the electrode contact pressure, which is encompassed by the structures of instant claims 38-40. Additionally, at least a portion of such projection would be located at an end of the branched flow passage of the interdigitated flow field, as claimed. Further, the use of a plurality of projections differing in height or width arranged consecutively in a longitudinal direction along the rib (as recited in claim 37) would be obvious since this would involve configuring the single graded projection discussed above into several discrete projections, which would be within the skill of the art. It is further submitted that the claims

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reciting that only the height or width is changed are also obvious in light of this rationale.

Accordingly, the claims are not considered to be distinguished over the references.

5. Claims 21-26 and 28-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2002-280024 in view of JP 8-096820.

JP '024 teaches a fuel cell comprising a membrane electrode assembly and first and second separators having ribs forming gas flow channels. The ribs of both separator plates have projections (34) thereon (see Figs. 1-4), function to press the respective electrodes. The gas flow channels are formed in parallel and are bundled into a serpentine shape. A projection is formed along the entire length of a rib (see Fig. 4), which anticipates which the limitation that the projection is located "on [a] bent rib of the gas flow path bundle."

JP '024 does not expressly teach that a plurality of projections that differ in at least one of a height and a width are provided on the rib as recited in claim 21, or that at least one of a height and a width of the projection continuously changes along the direction of the rib as recited in claim 28.

However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be sufficiently skilled to use different configurations of the projection of JP '024 to achieve the stated result of preventing a "short path" of reactant gas (see abstract of JP '024). In the absence of evidence to the contrary,

the duplication or rearrangement of parts is generally within the skill of the art (MPEP 2144.04).

In this case, the skilled artisan can vary the number and/or dimensions of the projections in an effort to more efficiently prevent leakage between the channel bundles.

Furthermore, JP 8-096820 teaches a fuel cell comprising a membrane electrode assembly and first and second separators having ribs forming gas flow channels. The ribs of both separator plates have one or a plurality of projections (246, 346, 446) on each rib (see Figs. 7, 9, and 11), which function to press the respective electrodes.

As disclosed throughout JP '820, the purpose of the invention is to enlarge the area of the gas diffusion electrode contributing to the electrochemical reaction by reducing contact pressure with the separator. The skilled artisan would be motivated to further modify JP '024 in an attempt to further the purposes of the invention of JP '820. For example, the artisan would be motivated to modify the projection(s) in an upstream-downstream direction (longitudinal direction) because it is known that reactant gas pressure is highest at the inlet of the flow field. To account for the flow field pressure drop, it would be obvious to use a graded projection on the rib to vary the electrode contact pressure, which is encompassed by the structures of instant claims 28-30. Further, the use of a plurality of projections differing in height or width arranged consecutively in a longitudinal direction along the rib (as recited in claim 26) would be obvious since this would involve configuring the single graded projection discussed above into several discrete projections, which would be within the skill of the art. It is further submitted that the claims reciting that only the height or width is changed are also obvious in light of this rationale. Accordingly, the claims are not considered to be distinguished over the references.

Response to Arguments

6. Applicant's arguments filed August 14, 2008 have been fully considered but they are not persuasive insofar as they apply to the present rejections. Applicants state that JP '820 makes no mention of gas leakage at a winding portion. However, JP '024, now applied to claims 21-26 and 28-31, is concerned with the problem of gas leakage in serpentine channels.

Further, Applicants traverse "the assertion that it would have been common knowledge in the art that 'reactant gas pressure is highest at the inlet of the flow field' of JP '820." However, this argument was previously addressed via citation of the Voss reference (U.S. Patent 5,441,819), at column 8, line 64 to column 10, line 4 thereof. Further, the Wilson reference explicitly discusses pressure drop as set forth the rejection above. Applicants further traverse the assertions that it would have been obvious to use a graded projection, or a plurality of projections in JP '820. In response, it is noted that the Office is not relying on "official notice" in making these assertions; rather, it is believed that these modifications would be within the skill of the art based on the rationales set forth in the rejections. Additionally, as previously stated by the Office, since pressure drop is a known phenomenon, the artisan would be motivated to modify the projection of JP '024 / JP '820 / Wilson so that contact pressure between the projection and the electrode is steadily decreased in a downstream direction to allow for the less-pressurized gas to have easier access to the "compressed" portions of the gas diffusion electrode, and also to allow for the balancing of the gas diffusion characteristics over the entire surface of the electrode. Furthermore, it has been held that choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success is generally within the skill of the

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art. *KSR v. Teleflex*, 82 USPQ2d 1385, 127 S. Ct. 1727 (2007). Applicant has not shown that use of the claimed configurations result in an unpredictable or unexpected difference from the prior art structures.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan, can be reached at (571) 272-1292. The phone number for the organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Jonathan Crepeau/
Primary Examiner, Art Unit 1795
March 20, 2009